

Appendix to “Subsidizing the spread of COVID19: Evidence from the UK”

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A Take-up evidence from anonymized individual-level transaction data

To corroborate the evidence of take-up of EOHO this paper leverages additional data capturing consumer demand more closely. Specifically, individual level anonymised transaction data from the UK Fintech Fable Data is leveraged in this appendix to document how EOHO increased demand for restaurant visits around the days and during weeks in which the subsidy was available.

This will directly corroborate the evidence from the Google Mobility data analysis and also shed some light suggesting that the results are unlikely to be confounded by other changes in mobility. Further, it corroborates the work of ? suggesting both little persistence and no notable spillover effects on other types of consumer spending – with the exception of reduced grocery shopping. As EOHO was anecdotally motivated by the wish to encourage wider economic activity, such as visiting of other retail outlets, this is suggestive that it may have failed to do so in delivering on this expectation.

Data and analysis The anonymized individual level transaction level data is collapsed to an unbalanced individual-level daily panel data set measuring the number of transaction across different types of vendors. Fable has classified the vendors into broad categories with restaurant and hospitality venues being classed as “Food and Beverage”, clothing retailers being classified as “Clothing & Apparel” and general online marketplaces being classified as “General Merchandise”, while grocery stores and chains would be labelled as such. The temporal granularity along with the granularity of the transaction types enables us to document more sharply the impacts that the scheme had on consumer behavior in a quite demanding empirical design.

Specifically, we estimate the following empirical specification:

$$y_{i,t} = \nu_i + \gamma_{l(i),w(t)} + \text{EOHO}_{d(t)} + \eta \times \text{Post}_t \times \text{EOHO}_{d(t)} + \epsilon_{d,t} \quad (1)$$

Here, $y_{i,t}$ measures number of transactions on a date t in a specific spending category. The regression exploits *within individual variation* by absorbing individual

level fixed effects v_i along with controlling for local authority by week fixed effects $\gamma_{l(i),t}$. The coefficient of interest is η , which captures the differential changes in $y_{i,t}$ on Monday-Wednesday during which the scheme was available during calendar weeks 32 to 36.

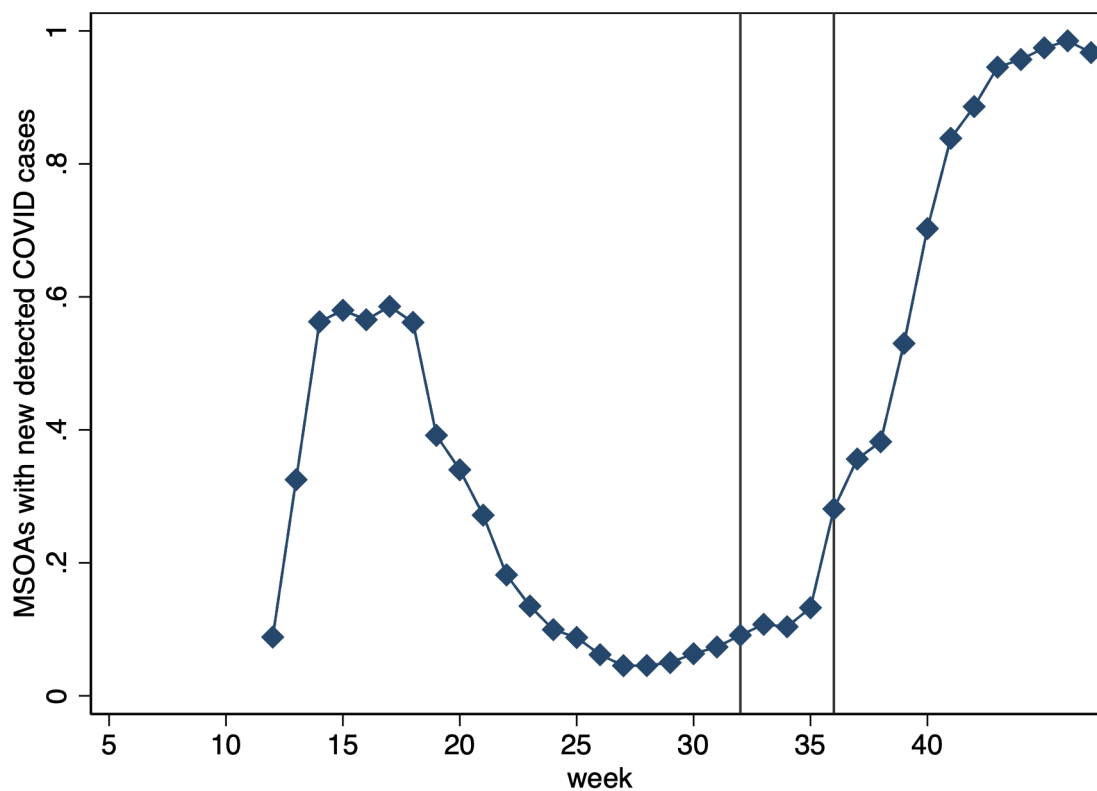
As with the main estimation we can pool the effect across weeks 32 to 36 to present results in tabular format, we can, however, also present results in visual format to provide additional evidence in support of the common trends assumption.

Results Appendix Table A2 documents that individual card use on days during which the subsidy was available saw a notable increase in transactions in Food and Beverage outlets – with an increase of activity by 8.8% relative to the baseline mean. There are no noticeable other effects on consumer activity with the exception of there being a significant decline in transactions for groceries, suggesting that EOHO-induced restaurant visits were substituting – not surprisingly – for spending on groceries. This suggests that there have been no other general patterns suggesting changes in consumer demand that may have shifted the risk exposure profile.

To complement the mobility analysis I have also incorporated the event study in Appendix Figure A5. This figure highlights that individual card transactions in Food and Beverage outlets strongly increased over the EOHO period and then declined again with the program ending, with no discernible pre-trends, again following the main results in the paper.

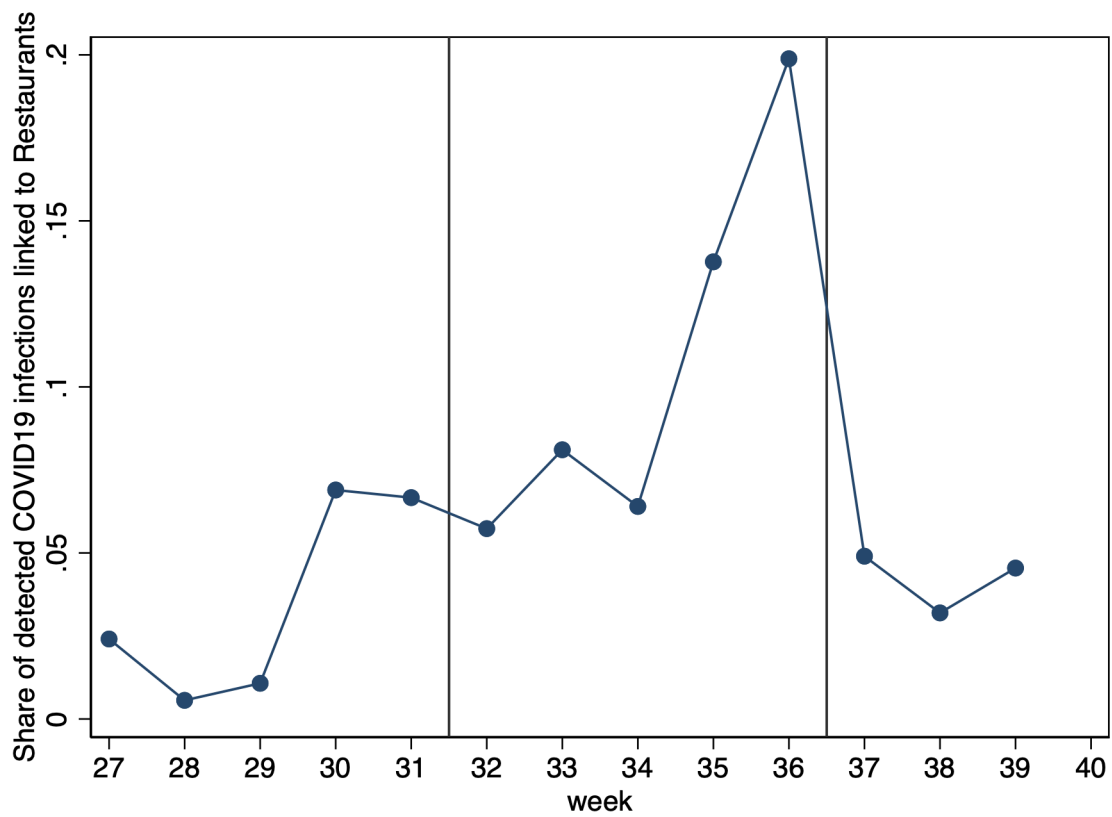
B Additional Figures and Tables

Figure A1: COVID19 spread across MSOA's in England



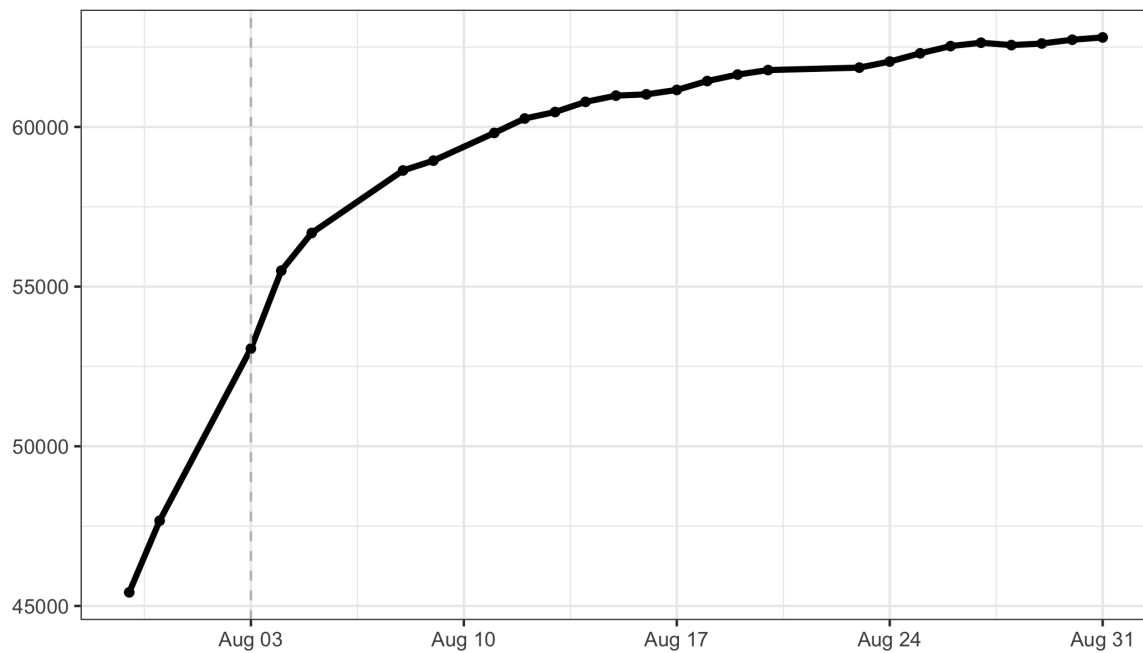
Notes: Figure plots the share of English MSOA's that report at least three new cases of COVID19 per calendar week. The vertical lines indicate the time that the Eat-Out-To-Help-Out scheme was open.

Figure A2: Share of COVID19 infections that have been contact traced to restaurants



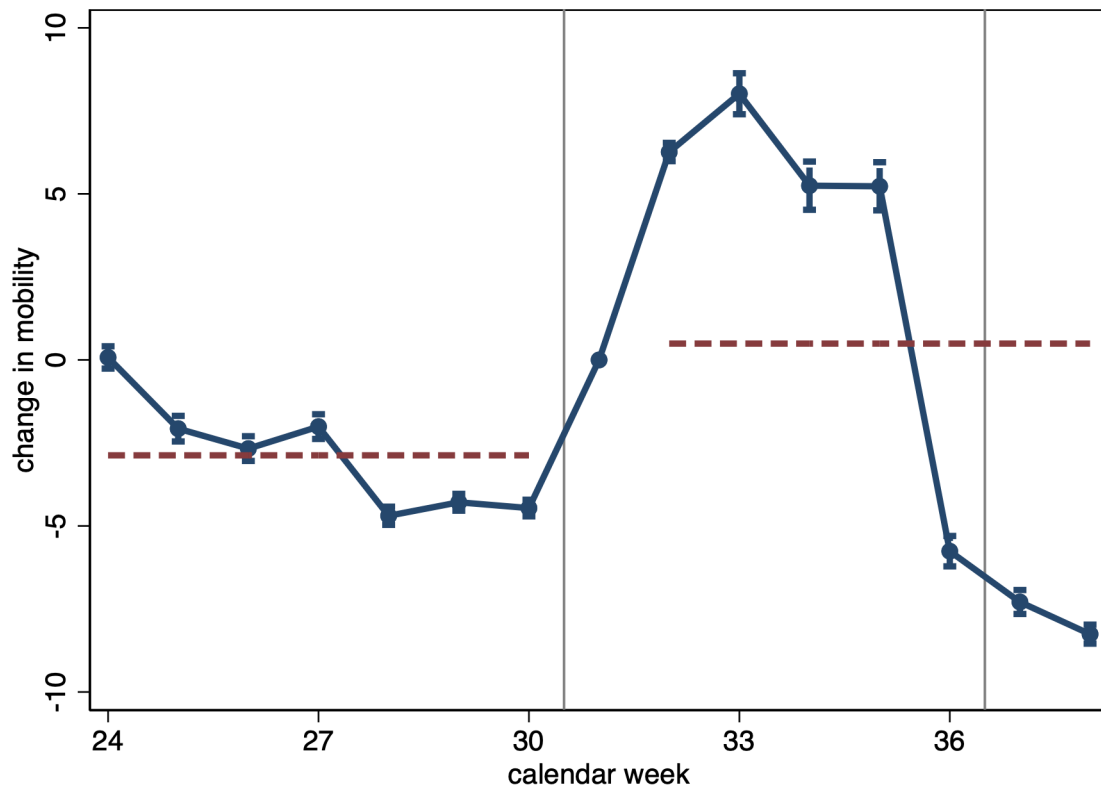
Notes: Figure plots data provided by the weekly COVID19 situation reports from Public Health England. During weeks 32 to 36, PHE identified 739 COVID19 infection incidents that were traced back to a specific origin. The figure plots the share of these incidents attributable to Food outlet/restaurants. The share drastically increases from around 5% to around 20% in week 36 and subsequently declining again after the EOH program ended. The PHE data is very incomplete. During calendar weeks 32 to calendar week 36 more than 50,000 COVID19 cases were detected highlighting that PHE was able to identify only a small share of the infections.

Figure A3: Number of restaurant premises registered to participate in the Eat-Out-To-Help-Out scheme across England



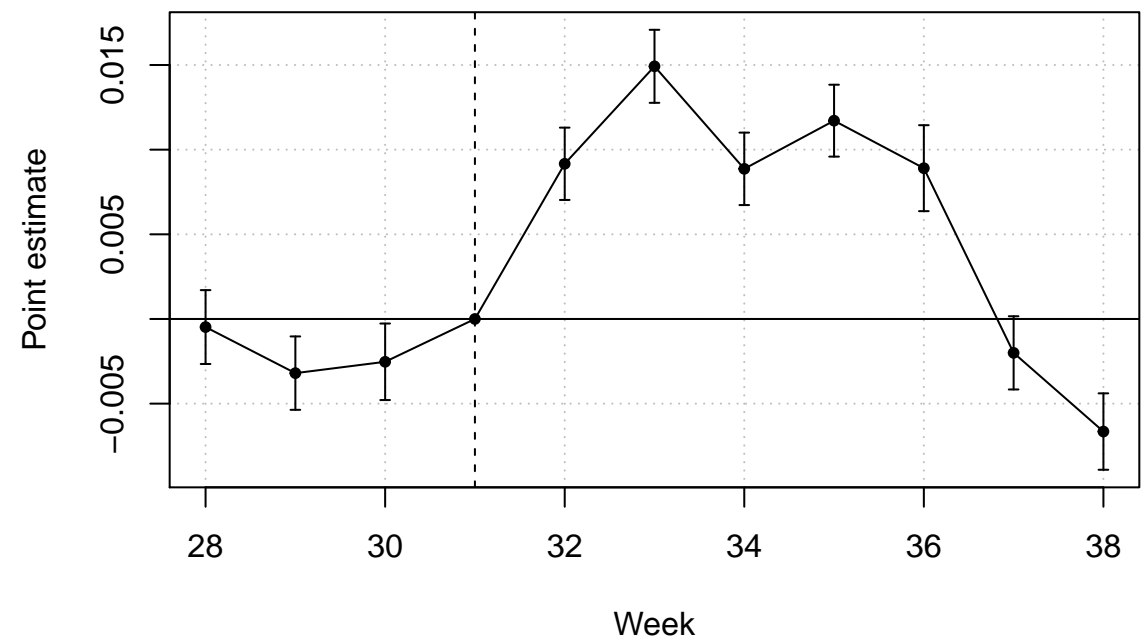
Notes: Time series plots the number of restaurants premises that are registered in the scheme at different points in time in England. The bulk of registrations is from HMRC's public github repository. Chain restaurant premises are added separately for completeness. Their inclusion does not affect the results substantially. The program started on Aug 3, 2020 and lasted until Aug 31, 2020. Dots indicate points where a flat file with the restaurants was downloadable from the HMRC Github repository track changes. The data in between is interpolated.

Figure A4: Differential increase in (likely) Restaurant visits on Monday-Wednesday during EOHO as measured by Google Mobility data



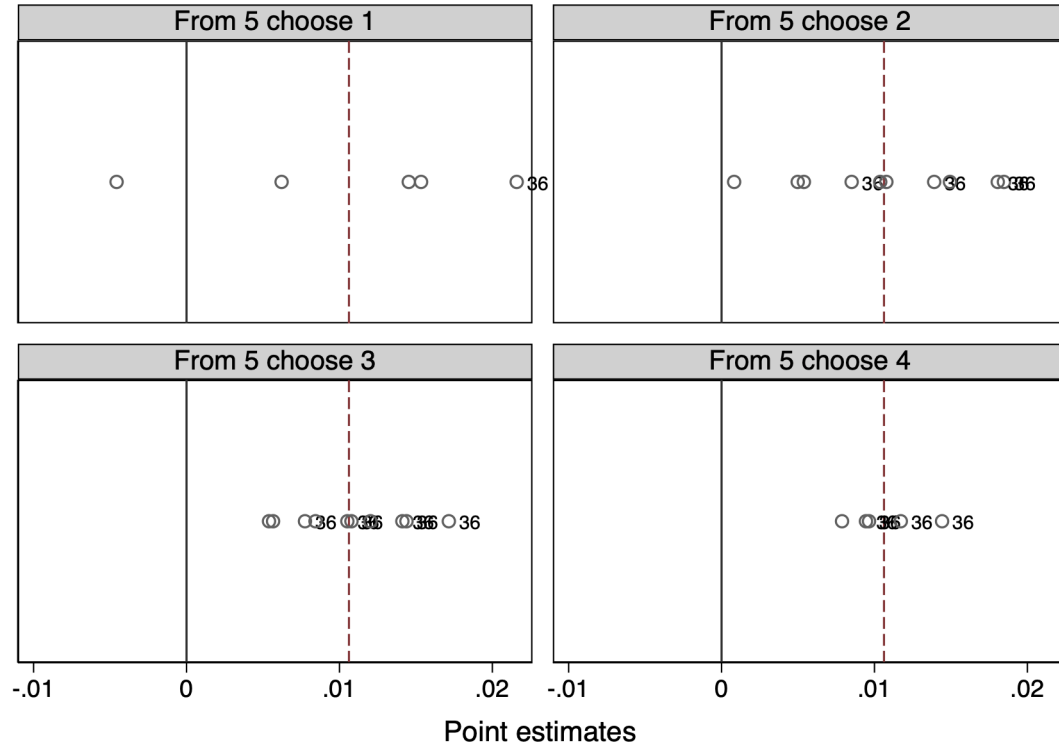
Notes: Figure plots the change in Google mobility measure on days during which the EOHO scheme was active (Monday, Tuesday, Wednesday) before and after the scheme was introduced from calendar week 32 inclusive onwards up until Monday 31, August inclusive in calendar week 36. The regression controls for district fixed effects, district-specific linear trends by calendar week and day of week fixed effects. 90% standard errors obtained from clustering standard errors at the district level are indicated.

Figure A5: Event Study: Impact of EOHO on transaction for Food and Beverage outlets over time



Notes: Figure plots regression results using individual anonymized card activity data from Fable Data. The point estimates represent the differential change in transactions for Food and Beverage outlets across calendar weeks from Mondays to Wednesdays when the EOHO discount was available from week 32 to week 36. All regressions include individual level fixed effects, district by week fixed effects and weekday fixed effects. 95% confidence intervals obtained from clustering standard errors two way at the date and district level are indicated.

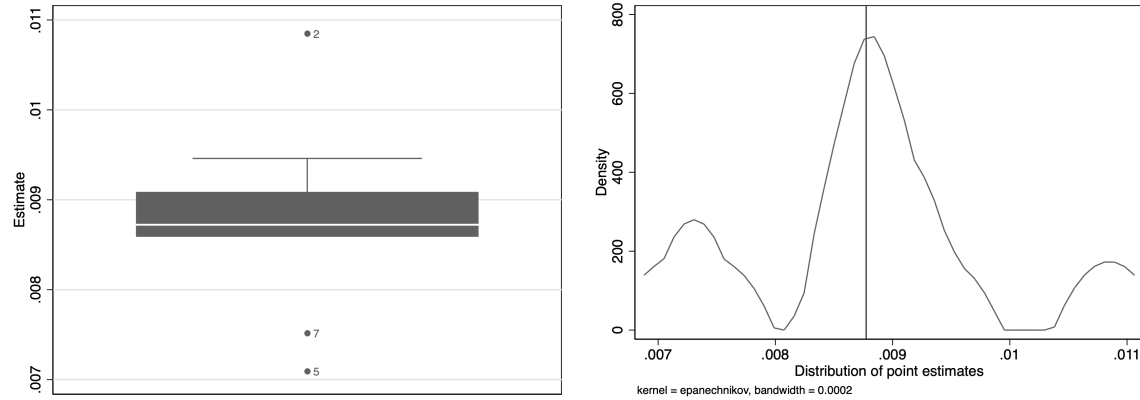
Figure A6: Robustness to dropping post-treatment weeks



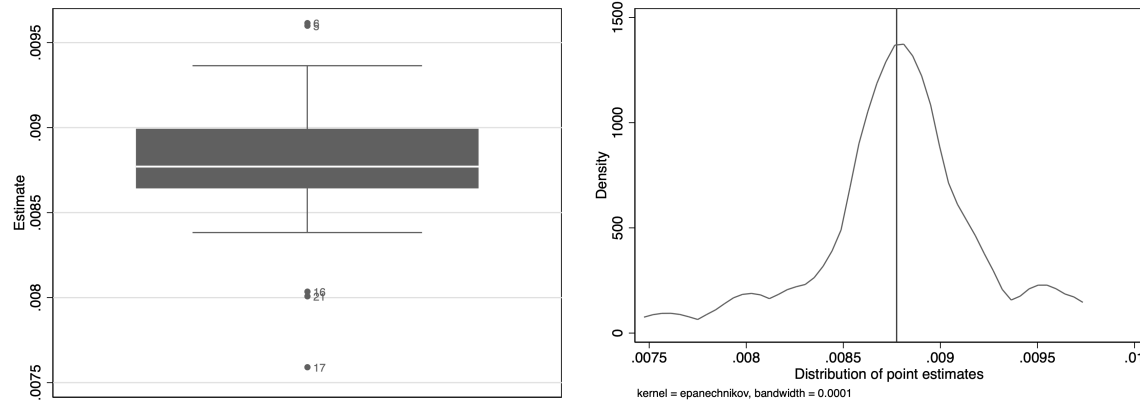
Notes: Figure plots the results of all permutations of dropping data pertaining to the post treatment weeks 32-36 from the analysis of specification (3) in Panel A of Table ??). In total, there are five weeks post treatment. The different figure panels provide the distribution of all possible estimated coefficients that are obtained after dropping 1, 2, 3, or 4 weeks of post-treatment data. The solid black line indicates zero, while the dashed line indicates the point estimate that is estimated using all post-treatment weeks. The results are only sensitive if only calendar weeks 32 and 33 are considered by themselves. Given the epidemiological lags and slowly expanding take-up of EOHO this is not surprising. The point estimates are higher if the post-treatment window includes calendar week 36 but results are carried also without that specific week.

Figure A7: Distribution of point estimates obtained when dropping one region a time

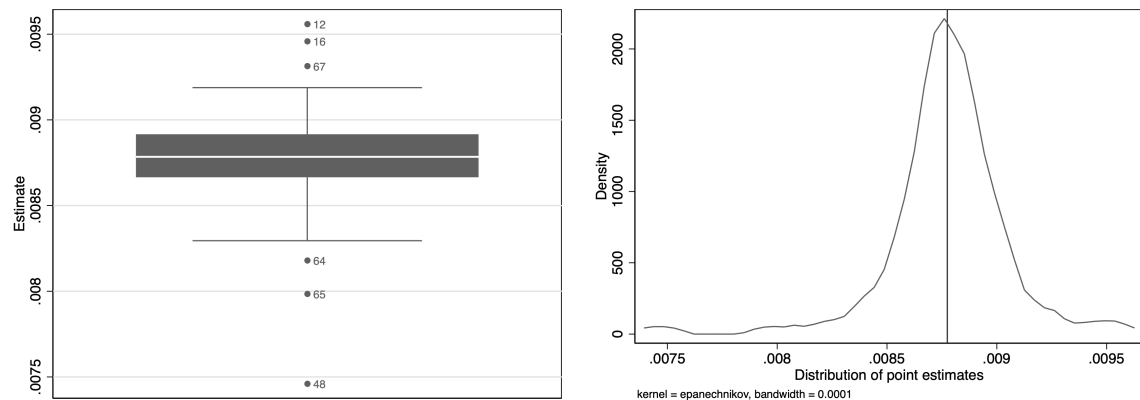
Panel A: Dropping each of the 9 NUTS1 regions in turn



Panel B: Dropping each of the 30 NUTS2 regions in turn



Panel C: Dropping each of the 93 NUTS3 regions in turn



Notes: Figures present the distribution of the point estimates obtained when dropping one region a time. The estimating regression has as dependent variable an indicator that is equal to 1 in case a new COVID19 cluster of more than two cases was detected in an MSOA. The regressions include MSOA fixed effects and district by time fixed effects. The coefficient estimate is the interaction between the post indicator marking the start of the ECHO scheme and the log of the number of number of restaurants +1 divided by the MSOA population. Standard errors are clustered at the district level.

Table A1: EOHO and Google Mobility

DV: Google mobility in	Retail & Recreation	Grocery	Parks	Transit	Workplace	Residential
	(1)	(2)	(3)	(4)	(5)	(6)
Post Week 32 \times EOHO Weekday	6.780*** (0.253)	-0.615*** (0.100)	6.489*** (1.178)	-1.295*** (0.258)	-2.625*** (0.077)	0.059** (0.023)
Mean DV	-31.568	-10.997	69.819	-31.403	-38.000	11.908
Observations	24061	24597	17023	24224	26925	26331
Clusters	312	311	300	311	312	311

Notes: Table presents difference-in-difference regression estimates studying the evolution of Google mobility measures at the district level over time between calendar weeks 24 and 36. The EOHO scheme was active on Mondays, Tuesdays and Wednesdays from August 3, 2020 to August 31, 2020 (calendar weeks 32 to 36). The dependent variable is the mobility measure relative to pre COVID19 levels per day across the categories provided by Google indicated in the column head. The regressions control for district FE, week fixed effects, and weekday fixed effects. Standard errors are clustered at the district level with stars indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A2: Impact of EOHO on consumer spending by type

	Food & Beverage	General Merchandize	Groceries	Health & Beauty	Leisure	Travel
EOHO day \times EOHO week	0.027*** (0.005)	-0.006 (0.007)	-0.012*** (0.005)	-0.004 (0.003)	0.000 (0.001)	-0.000 (0.001)
N	7586231	7586231	7586231	7586231	7586231	7586231
Card FE	X	X	X	X	X	X
Region \times Week FE	X	X	X	X	X	X
Day of Week FE	X	X	X	X	X	X
Mean	0.305	0.568	0.369	0.039	0.029	0.133

Notes: Table presents regression results showing the impact of EOHO on consumer spending as measured through anonymised individual-level card transaction data from Fable Data. All regressions control for card fixed effects, region by week fixed effects and day of week fixed effects. Standard errors, presented in parantheses, are clustered twoway by district and date with stars indicating * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Clustering of standard errors at different spatial levels: Impact of EOHO on Emergence of Local Infection Clusters

DV: Any new COVID19 cluster	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: Clustering at the local authority district level</i>						
Post \times log(EOHO covered meals per capita)	0.007*** (0.003)	0.007*** (0.003)	0.009*** (0.003)	0.009*** (0.003)	0.007*** (0.002)	0.007*** (0.002)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Clusters	317	317	317	317	317	317
<i>Panel B: Clustering at at NUTS3 region level</i>						
Post \times log(EOHO covered meals per capita)	0.007** (0.003)	0.007*** (0.003)	0.009*** (0.003)	0.009*** (0.003)	0.007*** (0.003)	0.007*** (0.003)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Clusters	93	93	93	93	93	93
<i>Panel C: Clustering at at NUTS2 region level</i>						
Post \times log(EOHO covered meals per capita)	0.007** (0.003)	0.007*** (0.003)	0.009*** (0.002)	0.009*** (0.003)	0.007*** (0.002)	0.007*** (0.002)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Clusters	30	30	30	30	30	30
Area by Week FE:	NUTS2	NUTS3	LAD	NUTS2	NUTS3	LAD

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSOA level on the emergence of new COVID19 infection clusters across the 13 calendar weeks from 24 to 36. A COVID19 infection cluster is defined as a week in which there were strictly more than two new COVID19 infections detected in tests taken during the week. All regressions control for MSOA-level fixed effects. The regression also control for time fixed effects specific to each NUTS2, NUTS3 or local authority specific week fixed effects. Standard errors are clustered at the level indicated in the panel head with starts indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4: Robustness of Impact of EOHO on Emergence of Local Infection Clusters: Alternative functional forms

DV: indicated in panel label	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Dependent variable: Any COVID19 cluster						
Post \times log(EOHO covered meals per capita)	0.007*** (0.003)	0.009*** (0.003)	0.009*** (0.003)			
Post \times log(EOHO restaurants per capita)				0.008*** (0.003)	0.009*** (0.003)	0.011*** (0.003)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Additional controls	390	1209	4121	390	1209	4121
Clusters	317	317	317	317	317	317
Panel B: Dependent variable: log(# of COVID19 cases in cluster)						
Post \times log(EOHO covered meals per capita)	0.012** (0.005)	0.015*** (0.005)	0.015*** (0.005)			
Post \times log(EOHO restaurants per capita)				0.011** (0.005)	0.013*** (0.005)	0.016*** (0.005)
Mean DV	0.167	0.167	0.167	0.167	0.167	0.167
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Additional controls	390	1209	4121	390	1209	4121
Clusters	317	317	317	317	317	317
Panel C: Dependent variable: Inverse hyperbolic sine (asinh) of # of COVID19 cases in cluster						
Post \times log(EOHO covered meals per capita)	0.015** (0.006)	0.019*** (0.006)	0.020*** (0.007)			
Post \times log(EOHO restaurants per capita)				0.014** (0.006)	0.018*** (0.006)	0.021*** (0.006)
Mean DV	0.214	0.214	0.214	0.214	0.214	0.214
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Additional controls	390	1209	4121	390	1209	4121
Clusters	317	317	317	317	317	317
Area by Week FE:	NUTS2	NUTS3	LAD	NUTS2	NUTS3	LAD

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSA level on the emergence of new COVID19 infection clusters across the 13 calendar weeks from 24 to 36. The dependent variable is 1 in case an MSA reported more than two new detected infections per calendar week. The independent variable in panel A measures the EOHO scheme as the log number of meals served in restaurants in an MSA that participate in the EOHO scheme plus 1 divided by the population in the area. The independent variable in panel B measures the EOHO scheme as the log number of restaurants that participate in the EOHO scheme in an MSA plus 1 divided by the population in the area. The specifications across panels explore the robustness to controlling for more granular non-linear time fixed effects. NUTS refers to the nomenclature unit@ territorialiales statistiques which subdivides the England into 11, 30 and 93 regions. LAD refers too local authority districts. PCON refers to Westminster parliamentary constituencies. Standard errors are clustered at the district level with stars indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5: Robustness of Impact of EOHO on Emergence of Local Infection Clusters: Additional non-parametric control variables

DV: Any new COVID19 cluster	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Measuring EOHO by imputed meals per capita						
Post \times log(EOHO covered meals per capita)	0.009*** (0.003)	0.009*** (0.003)	0.008*** (0.003)	0.007** (0.003)	0.006** (0.003)	0.005** (0.003)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88270	88270	88270	88270	88270
Clusters	317	316	316	316	316	316
Panel B: Measuring EOHO by number of restaurants per capita						
Post \times log(EOHO restaurants per capita)	0.011*** (0.003)	0.010*** (0.003)	0.010*** (0.003)	0.008*** (0.003)	0.006** (0.003)	0.006** (0.003)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88270	88270	88270	88270	88270
Clusters	317	316	316	316	316	316
Week \times Additional control:						
Population density measures		X	X	X	X	X
Spring 2020 COVID19 exposure			X	X	X	X
Commuting exposure				X	X	X
Student exposure					X	X
Tenure types						X

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSOA level on the emergence of new COVID19 infection clusters across the 13 calendar weeks from 24 to 36. The dependent variable is 1 in case an MSOA reported more than two new detected infections per calendar week. The specifications across panels explore the robustness to adding additional successively more MSOA-level control variables interacted with week fixed effects to account for non-linear trends in these measures. Population density measures include: population density, the standard deviation of population density across lower-level super output areas (LSOAs) that make up the MSOA, and the area size of the MSOA in km². Spring 2020 COVID measures an MSOA's exposure to COVID from March to July 2020 as the number of COVID19 deaths per capita ; the number of COVID19 cases per capita; the number of non-COVID19 deaths per capita and the share of COVID19 deaths among all deaths. Commuting exposure measures based on 2011 census the number of people usually commuting for work into an MSOA divided by the MOSA's population; the number of commuters usually resident but commuting elsewhere divided by the MSOA's population. Student exposure measures based on the 2011 census the share of full time students resident in an MSOA. Tenure types measures the share of households living in rented or owned accommodation. All regressions also control for local authority by week fixed effects. Standard errors are clustered at the district level with stars indicating *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A6: Robustness of Impact of EOHO on Emergence of Local Infection Clusters: Alternative fixed effects

DV: Any new COVID19 cluster	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Measuring EOHO by imputed meals per capita						
Post \times log(EOHO covered meals per capita)	0.007*** (0.003)	0.007*** (0.003)	0.009*** (0.003)	0.009*** (0.003)	0.007*** (0.002)	0.007*** (0.002)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Additional controls	117	390	1209	4121	6929	9373
Clusters	317	317	317	317	317	317
Panel B: Measuring EOHO by number of restaurants per capita						
Post \times log(EOHO restaurants per capita)	0.006** (0.003)	0.008*** (0.003)	0.009*** (0.003)	0.011*** (0.003)	0.008*** (0.002)	0.008*** (0.002)
Mean DV	0.096	0.096	0.096	0.096	0.096	0.096
Observations	88283	88283	88283	88283	88283	88283
MSOA	6791	6791	6791	6791	6791	6791
Additional controls	117	390	1209	4121	6929	9373
Clusters	317	317	317	317	317	317
Area by Week FE:	NUTS1	NUTS2	NUTS3	LAD	PCON	PCON \times LAD

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSA level on the emergence of new COVID19 infection clusters across the 13 calendar weeks from 24 to 36. The dependent variable is 1 in case an MSA reported more than two new detected infections per calendar week. The independent variable in panel A measures the EOHO scheme as the log number of meals served in restaurants in an MSA that participate in the EOHO scheme plus 1 divided by the population in the area. The independent variable in panel B measures the EOHO scheme as the log number of restaurants that participate in the EOHO scheme in an MSA plus 1 divided by the population in the area. The specifications across panels explore the robustness to controlling for more granular non-linear time fixed effects. NUTS refers to the nomenclature unit des territoires statistiques which subdivides the England into 11, 30 and 93 regions. LAD refers too local authority districts. PCON refers to Westminster parliamentary constituencies. Standard errors are clustered at the district level with stars indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A7: Reduced Form Impact of Rainfall on EOHO days on emergence of local COVID19 infection clusters: leads and lagged effects

DV: Any new COVID19 cluster	(1)	(2)	(3)
Rainfall on EOHO days during lunch and dinner time	-0.011* (0.006)	-0.012** (0.006)	-0.013* (0.007)
Previous weeks Rainfall on EOHO days during lunch and dinner time		-0.006 (0.006)	-0.006 (0.007)
Next weeks Rainfall on EOHO days during lunch and dinner time			-0.001 (0.007)
Mean DV	0.143	0.143	0.143
Observations	33955	33955	33955
Clusters	317	317	317

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSOA level on the emergence of new COVID19 infection clusters during calendar weeks 32 to 36. All regressions also control for local authority by week fixed effects. Standard errors are clustered at the district level with stars indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A8: Reduced Form Impact of Rainfall on EOHO days on emergence of local COVID19 infection clusters later in the week: alternative rainfall measures

	(1)	(2)	(3)
<i>Panel A: Any significant rainfall</i>			
Significant Rainfall on EOHO days during lunch and dinner time	-0.027*** (0.009)	-0.027*** (0.009)	-0.027*** (0.009)
Significant Rainfall on Non-EOHO days during lunch and dinner time		0.001 (0.010)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.008 (0.013)
Mean DV	0.143	0.143	0.143
Observations	33955	33955	33955
Clusters	317	317	317
<i>Panel B: Rainfall in levels</i>			
Rainfall on EOHO days during lunch and dinner time	-0.004* (0.002)	-0.004* (0.002)	-0.004* (0.002)
Rainfall on Non-EOHO days during lunch and dinner time		0.002 (0.002)	
Rainfall on EOHO days outside lunch and dinner hours			0.000 (0.001)
Mean DV	0.143	0.143	0.143
Observations	33955	33955	33955
Clusters	317	317	317

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSOA level on the emergence of new COVID19 infection clusters during calendar weeks 32 to 36. All regressions also control for local authority by week fixed effects. Standard errors are clustered at the district level with stars indicating *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A9: Reduced Form Impact of Rainfall on EOHO days on emergence of local COVID19 infection clusters later in the week: alternative dependent variables

	(1)	(2)	(3)
Panel A: Any new COVID19 infection cluster			
Significant Rainfall on EOHO days during lunch and dinner time	-0.027*** (0.009)	-0.027*** (0.009)	-0.027*** (0.009)
Significant Rainfall on Non-EOHO days during lunch and dinner time		0.001 (0.010)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.008 (0.013)
Mean DV	0.143	0.143	0.143
Observations	33955	33955	33955
Clusters	317	317	317
Panel B: log(# of new COVID19 cases+1)			
Significant Rainfall on EOHO days during lunch and dinner time	-0.044** (0.018)	-0.044** (0.018)	-0.042** (0.017)
Significant Rainfall on Non-EOHO days during lunch and dinner time		-0.005 (0.016)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.033 (0.023)
Mean DV	0.249	0.249	0.249
Observations	33955	33955	33955
Clusters	317	317	317
Panel C: # of new COVID19 cases			
Significant Rainfall on EOHO days during lunch and dinner time	-0.148** (0.074)	-0.148** (0.074)	-0.133* (0.071)
Significant Rainfall on Non-EOHO days during lunch and dinner time		-0.072 (0.054)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.295** (0.149)
Mean DV	0.763	0.763	0.763
Observations	33955	33955	33955
Clusters	317	317	317

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSOA level on the emergence of new COVID19 infection clusters during calendar weeks 32 to 36. All regressions also control for local authority by week fixed effects. Standard errors are clustered at the district level with stars indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A10: Reduced Form Impact of Rainfall on EOHO days on Google mobility across districts over time

	(1)	(2)	(3)
Panel A: Recreation and Retail			
Significant Rainfall on EOHO days during lunch and dinner time	-1.668*** (0.341)		-1.549*** (0.342)
Significant Rainfall on non-EOHO days during lunch and dinner time		-0.707** (0.335)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.373 (0.381)
Mean DV	-8.244	-21.968	-8.244
Observations	2401	4233	2401
Clusters	311	312	311
Panel B: Grocery			
Significant Rainfall on EOHO days during lunch and dinner time	-0.823*** (0.220)		-0.681*** (0.215)
Significant Rainfall on non-EOHO days during lunch and dinner time		-0.625** (0.258)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.470* (0.248)
Mean DV	-12.288	-12.136	-12.288
Observations	2893	4336	2893
Clusters	311	311	311
Panel C: Parks			
Significant Rainfall on EOHO days during lunch and dinner time	-21.561*** (3.498)		-17.465*** (3.305)
Significant Rainfall on non-EOHO days during lunch and dinner time		-7.747*** (2.923)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-8.881** (4.368)
Mean DV	92.791	75.969	92.791
Observations	937	2179	937
Clusters	239	295	239
Panel D: Transit			
Significant Rainfall on EOHO days during lunch and dinner time	-1.125** (0.453)		-0.762* (0.437)
Significant Rainfall on non-EOHO days during lunch and dinner time		0.263 (0.503)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-1.165** (0.558)
Mean DV	-35.748	-27.783	-35.748
Observations	2934	3947	2934
Clusters	311	311	311
Panel E: Workplace			
Significant Rainfall on EOHO days during lunch and dinner time	-0.177** (0.087)		-0.119 (0.088)
Significant Rainfall on non-EOHO days during lunch and dinner time		-1.065*** (0.282)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.195* (0.102)
Mean DV	-46.681	-32.225	-46.681
Observations	4624	4837	4624
Clusters	312	312	312
Panel F: Residential			
Significant Rainfall on EOHO days during lunch and dinner time	0.352*** (0.040)		0.309*** (0.041)
Significant Rainfall on non-EOHO days during lunch and dinner time		0.726*** (0.076)	
Significant Rainfall on EOHO days outside lunch and dinner hours			0.150*** (0.050)
Mean DV	11.417	7.504	11.417
Observations	4647	5533	4647
Clusters	311	311	311

Notes: Table presents difference-in-difference regression estimates studying the impact of the EOHO at the MSOA level on the emergence of new COVID19 infection clusters during calendar weeks 32 to 36. All regressions also control for local authority by week fixed effects. Standard errors are clustered at the district level with stars indicating *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A11: Reduced Form Impact of Rainfall on EOHO days on Google mobility scores proxying visits to restaurants and cafe's across districts over time

DV: Google mobility visits to restaurants	(1)	(2)	(3)
<i>Panel A: Data window covering exactly the EOHO scheme</i>			
Significant Rainfall on EOHO days during lunch and dinner time	-1.031** (0.405)		-0.964** (0.390)
Significant Rainfall on non-EOHO days during lunch and dinner time		-0.493 (0.427)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.329 (0.523)
Mean DV	-8.244	-21.968	-8.244
Observations	2401	4233	2401
Clusters	311	312	311
<i>Panel B: Data window four week window prior to EOHO scheme</i>			
Significant Rainfall on EOHO days during lunch and dinner time	0.482 (1.151)		-0.021 (1.136)
Significant Rainfall on non-EOHO days during lunch and dinner time		2.040 (1.408)	
Significant Rainfall on EOHO days outside lunch and dinner hours			2.132** (0.932)
Mean DV	-21.407	-28.633	-21.407
Observations	3732	4979	3732
Clusters	311	312	311
<i>Panel C: Data window four weeks after the EOHO scheme</i>			
Significant Rainfall on EOHO days during lunch and dinner time	0.700 (0.728)		0.696 (0.725)
Significant Rainfall on non-EOHO days during lunch and dinner time		-1.379* (0.764)	
Significant Rainfall on EOHO days outside lunch and dinner hours			-0.106 (0.759)
Mean DV	-13.965	-18.172	-13.965
Observations	2918	4478	2918
Clusters	311	312	311

Notes: Table presents regression estimates studying the impact of inclement weather on Google mobility proxies capturing visits to Restaurants and Cafes within local authority districts over time. Column (1) and (3) exploit intra-day variation in rainfall falling during core lunch and dinner hours and outside these hours to study its impact on mobility to restaurants on Mondays to Wednesdays during which the EOHO scheme would have been available during calendar weeks 32 to 36. Column (2) explores the impact of rainfall falling during core lunch and dinner hours on restaurant visits occurring from Thursdays to Sundays – days during which the EOHO discount would not have been available. Panel A focuses on the calendar weeks 32 to 36 when the EOHO was available, while Panel B and Panel C can be thought of as placebo exercises studying the rainfall and mobility relationships during times when the EOHO scheme was not available. All regressions control for district fixed effects and NUTS2 area by date fixed effects. Standard errors are clustered at the district level with stars indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A12: Quantification of EOHO Impact on Case Counts

	Mid	Lower	Upper
Panel A: Overall cases during EOHO calendar weeks 32 to 36			
ONS Infection Survey Estimate	107,100	73,400	149,100
Lab Confirmed COVID19 Cases	45,382		
Panel B: % of infections due to EOHO			
	0.116	0.106	0.146
Estimates of absolute case counts caused by EOHO			
Panel C: direct infection counts			
based on lab confirmed COVID19 cases	5,264	4,798	6,643
based on ONS Infection Survey Estimate	12,423	11,352	15,804
based on ONS Infection Survey Lower	8,514	7,759	10,744
based on ONS Infection Survey Upper	17,296	15,762	21,824
Panel D: including indirect assuming 0.5 onward infections			
based on lab confirmed COVID19 cases	16,646	16,179	18,024
based on ONS Infection Survey Estimate	39,283	35,800	49,569
based on ONS Infection Survey Lower	26,922	24,535	33,972
based on ONS Infection Survey Upper	54,689	49,839	69,008

Notes: Panel A presents the infection estimates for England between calendar weeks 32 to 36 inclusive. The table distinguishes between lab confirmed COVID19 infections and estimates derived from the representative ONS Infection Survey. Panel B provides the point estimates derived from the analysis expressed as the % of cases attributable to EOHO. Panel C provides absolute number of cases estimates of direct infections. Panel D provides an illustrative calculation of the dynamic impact of EOHO beyond week 36 assuming that each infection triggered 0.5 onward infections in the subsequent four week period.